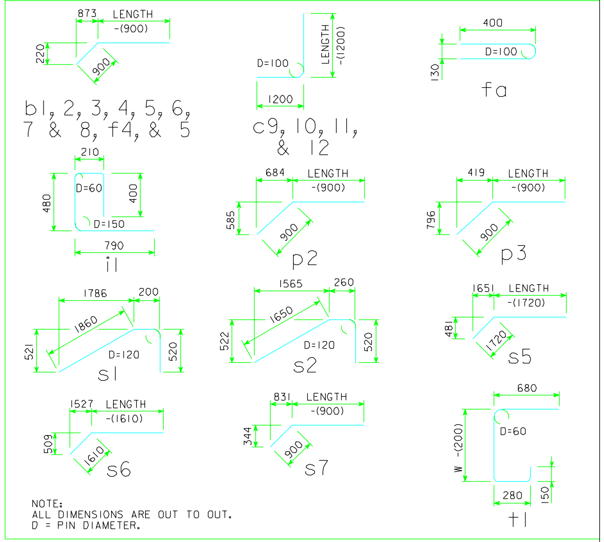
BILL OF REINFORCING FOR ONE HEADWALL
15° SKEW CULVERT SPAN X CULVERT HEIGHT

LOCATION	SHAPE	SIZE	MARK	2400x3000			2400x2400			2400x1800			MARK
				NO.	LENGTH	MASS	NO.	LENGTH	MASS	NO.	LENGTH	MASS	
FENCE ANCHOR		15	fa	2	930	3	2	930	3	2	930	3	fa
WINGWALL BFH L		15	b1	1	11 490	18	1	9430	15	1	7370	12	b1
WINGWALL BFH S		15	b2	1	10 150	16	1	8350	13	1	6550	10	b2
WINGWALL BFH L		15	b3	8 (LENGTH VARIES)	3720 TO 10 930	92	6 (LENGTH VARIES)	3720 TO 8870	59	4 (LENGTH VARIES)	3720 TO 6810	33	b3
WINGWALL BFH S		15	b4	8 (LENGTH VARIES)	3360 TO 9670	82	6 (LENGTH VARIES)	3360 TO 7870	53	4 (LENGTH VARIES)	3360 TO 6070	30	b4
WINGWALL FFH L		15	b5	1	11 490	18	1	9430	15	1	7370	12	b5
WINGWALL FFH S		15	b6	1	10 150	16	1	8350	13	1	6550	10	b6
WINGWALL FFH L		15	b7	9 (LENGTH VARIES)	2690 TO 10 930	96	7 (LENGTH VARIES)	2690 TO 8870	64	5 (LENGTH VARIES)	2690 TO 6810	37	b7
WINGWALL FFH S		15	b8	9 (LENGTH VARIES)	2460 TO 9670	86	7 (LENGTH VARIES)	2460 TO 7870	57	5 (LENGTH VARIES)	2460 TO 6070	33	b8
CENTER WALL EFH		15	b9	17 (LENGTH VARIES)	1450 TO 7090	114	13 (LENGTH VARIES)	1470 TO 5850	75	9 (LENGTH VARIES)	1500 TO 4600	43	b9
WINGWALL FFV L		15	c1	35 (LENGTH VARIES)	770 TO 3740	124	29 (LENGTH VARIES)	770 TO 3220	91	22 (LENGTH VARIES)	770 TO 2610	58	c1
WINGWALL FFV S		15	c2	31 (LENGTH VARIES)	780 TO 3780	111	25 (LENGTH VARIES)	780 TO 3180	78	19 (LENGTH VARIES)	780 TO 2580	50	c2
WINGWALL FFV L		15	c3	2	3700	12	2	3100	10	2	2500	8	c3
WINGWALL FFV S		15	c3	1	3700	6	1	3100	5	1	2500	4	c3
CENTER WALL EFV		15	c4	2	440	1	2	440	1	2	430	1	c4
CENTER WALL EFV		15	c5	41 (LENGTH VARIES)	500 TO 3050	114	33 (LENGTH VARIES)	500 TO 2470	77	25 (LENGTH VARIES)	490 TO 1890	47	c5
CENTER WALL EFV		15	c6	2	3160	10	2	2560	8	2	1960	6	c6
WINGWALL BFV L		15	c7	9 (LENGTH VARIES)	770 TO 1470	16	9 (LENGTH VARIES)	770 TO 1470	16	9 (LENGTH VARIES)	770 TO 1470	16	c7
WINGWALL BFV S		15	c8	6 (LENGTH VARIES)	780 TO 1280	10	6 (LENGTH VARIES)	780 TO 1280	10	6 (LENGTH VARIES)	780 TO 1280	10	c8
WINGWALL BFV L		15	c9	26 (LENGTH VARIES)	2760 TO 4940	157	20 (LENGTH VARIES)	2760 TO 4420	113	13 (LENGTH VARIES)	2760 TO 3810	67	c9
WINGWALL BFV S		15	c10	25 (LENGTH VARIES)	2580 TO 4980	148	19 (LENGTH VARIES)	2580 TO 4380	104	13 (LENGTH VARIES)	2580 TO 3780	65	c10
WINGWALL BFV L		15	c11	17	3150	84	10	3150	49	-----	-----	0	c11
WINGWALL BFV S		15	c11	13	3150	64	7	3150	35	-----	-----	0	c11
WINGWALL BFV L		15	c12	2	4900	15	2	4300	14	2	3700	12	c12
WINGWALL BFV S		15	c12	1	4900	8	1	4300	7	1	3700	6	c12
APRON LONG BOT		15	d1	11	7300	126	11	6060	105	11	4810	83	d1
APRON LONG BOT L		15	d2	3	10 020	47	3	7980	38	3	5950	28	d2
APRON LONG BOT S		15	d3	3	8790	41	3	7010	33	3	5240	25	d3
APRON LONG TOP		20	f1	16	7300	275	16	6060	228	16	4810	181	f1
APRON LONG TOP L		20	f2	9 (LENGTH VARIES)	350 TO 6450	72	7 (LENGTH VARIES)	630 TO 5210	48	5 (LENGTH VARIES)	890 TO 3960	29	f2
APRON LONG TOP S		20	f3	8 (LENGTH VARIES)	380 TO 6480	65	6 (LENGTH VARIES)	860 TO 5240	43	5 (LENGTH VARIES)	460 TO 3990	26	f3
APRON LONG TOP L		20	f4	1	11 490	27	1	9430	22	1	7370	17	f4
APRON LONG TOP S		20	f5	1	10 150	24	1	8350	20	1	6550	15	f5
PARAPET VERT		15	i1	37	1880	109	37	1880	109	36	1880	106	i1
PARAPET HORIZ		25	j1	4	5660	89	4	5660	89	4	5580	88	j1
APRON TRANS TOP		20	m1	4 (LENGTH VARIES)	5590 TO 5750	53	4 (LENGTH VARIES)	5590 TO 5750	53	4 (LENGTH VARIES)	5510 TO 5670	53	m1
APRON TRANS TOP		20	m2	23 (LENGTH VARIES)	5790 TO 8100	376	17 (LENGTH VARIES)	5790 TO 7470	265	12 (LENGTH VARIES)	5720 TO 6870	178	m2
APRON TRANS TOP		20	m3	3 (LENGTH VARIES)	4580 TO 6050	38	3 (LENGTH VARIES)	4340 TO 5730	36	3 (LENGTH VARIES)	3320 TO 4780	29	m3
APRON TRANS TOP		20	m4	2	4040	19	2	3480	16	2	3380	16	m4
APRON TRANS BOT		20	m5	20 (LENGTH VARIES)	3920 TO 6990	257	16 (LENGTH VARIES)	3920 TO 6340	193	12 (LENGTH VARIES)	3890 TO 5670	135	m5
CURTAIN HORIZ		20	p1	4	5180	49	4	5180	49	4	5180	49	p1
CURTAIN HORIZ L		20	p2	4	5650	53	4	4750	45	4	3840	36	p2
CURTAIN HORIZ S		20	p3	4	4390	41	4	3730	35	4	3060	29	p3
WING SLOPE EF L		20	s1	2	2580	12	2	2580	12	2	2580	12	s1
WING SLOPE EF S		20	s2	2	2430	11	2	2430	11	2	2430	11	s2
WING SLOPE EF L		20	s3	2	10 090	48	2	7950	37	2	5800	27	s3
WING SLOPE EF S		20	s4	2	9030	43	2	7130	34	2	5210	25	s4
WING SLOPE FF L		20	s5	1	11 930	28	1	9780	23	1	7640	18	s5
WING SLOPE FF S		20	s6	1	10 640	25	1	8750	21	1	6850	16	s6
CENTER WALL EFH		20	s7	2	7780	37	2	6410	30	2	5030	24	s7
CURTAIN VERT		15	t1	32	2260	114	27	2110	89	23	1960	71	t1
	REINF STEEL			3500 kg			2669 kg			1900 kg			
ESTIMATED QUANTITIES ONE HEADWALL	CONC	PARAPET∆		1.5	38.9 m³		1.5	28.9 m³		1.4	19.5 m³		
		WINGS		13.1			8.8			4.8			
		FOOTING		24.3			18.6			13.3			

NOTE:

∆ INCLUDES TOP OF WINGWALL QUANTITIES
L DENOTES LONG WING
S DENOTES SHORT WING

BENT BAR DETAILS



NOTE:
ALL DIMENSIONS ARE OUT TO OUT.
D = PIN DIAMETER.

HEADWALL NOTES:

THIS HEADWALL IS BASED ON A 3:1 SLOPE NORMAL TO CENTERLINE OF ROADWAY.

THE SIDES OF THE FOOTING ARE TO BE FORMED TO INSURE CORRECT LINE AND GRADE.

ALL EXPOSED CORNERS OF 90° OR SHARPER ARE TO BE FILLETED WITH A 20 mm DRESSED AND BEVELED STRIP.

ALL REINFORCING IS TO BE SECURELY WIRED IN PLACE BEFORE THE CONCRETE IS POURED. ALL SLAB AND FLOOR REINFORCING STEEL IS TO BE SUPPORTED BY BAR CHAIRS AT INTERVALS OF NOT MORE THAN 900 mm IN EITHER DIRECTION AS OUTLINED IN THE STANDARD SPECIFICATIONS.

CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR REINFORCING BAR IS TO BE 50 mm UNLESS OTHERWISE NOTED OR SHOWN. CLEARANCE TO THE BOTTOM ENDS OF VERTICAL BARS SHALL BE 75 mm.

CONCRETE QUANTITIES ARE ESTIMATED FROM BACK OF PARAPET.

HORIZONTAL TAILS OF BARS "b" & "s" ESTIMATED TO EXTEND 600 mm BEYOND BACK OF PARAPET (INTO END OF BARREL). LONGITUDINAL BARS "d", "f1", AND "f3" ESTIMATED TO PROJECT INTO END SECTION OF BARREL A MINIMUM OF 600mm BEYOND BACK OF PARAPET.

THE "LENGTH" COLUMN REFLECTS TOTAL NUMBER OF MILLIMETERS NECESSARY TO MEET CLEARANCE REQUIREMENTS. "MASS" COLUMN INCLUDES AN ALLOWANCE OF 650 mm FOR LAP ON BARS THAT ARE OVER 12 000 mm LONG.

NOTES:

1. SEE SHEET MTWRCB-G1-95 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.

LATEST REVISION DATE : 04-02

APPROVED BY :

STANDARD DESIGN

FLARED WING HEADWALLS

FOR
TWIN REINFORCED CONCRETE BOX CULVERTS

PROJECT DEVELOPMENT DIVISION
IOWA DEPARTMENT OF TRANSPORTATION

JULY, 1995

MTWH 15-6-95

REVISED 1/98; BEND DIMENSIONS OF i1 BAR CHANGED.
REVISED 04-02 - CONCRETE QUANTITIES ADJUSTED.
TWH156M.S01

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